

Thirty-Day Mortality in COVID-19 Positive Patients With Hip Fractures: A Case-Series and Literature Review

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Abstract

Introduction: The novel coronavirus has spread rapidly around the world with particularly high mortality in the elderly. Care and nursing homes have become the sites of greatest concentration of cases. We intended to review 30-day mortality of COVID-19 patients with hip fractures. This is relevant given the disease impact in this age group. **Methods:** Medline and Embase databases were searched for relevant studies linked to mortality and morbidity in COVID-19 patients who have undergone non-elective hip surgeries using the keywords “COVID-19”OR “SARS-cov-2”OR “Coronavirus Infections”; AND “Surgery”OR “Hip”OR “Fracture”OR “Orthopedics.” We included all patients with hip fractures, but excluded pathological fractures and other non-traumatic hip pathologies. Four-hundred and eighty-one articles were identified for screening, in addition to an unpublished case-series of 67 patients that have 3 cases turned positive for COVID 19, yielding a total of 50 patients for the final review. **Results:** The study included 4 articles published until May 9th 2020 and a case-series: 26(52%) patients were females; the median age was 86 years; hypertension(53.6%), diabetes mellitus type II(28.6%), and coronary artery heart disease(25%) were the most common comorbidities; 34(68%) patients had intertrochanteric hip fracture and 16(32%) patients had femoral neck fractures; 22(59.5%) patients underwent cephalomedullary nail fixation, 12(32.4%) patients had hemiarthroplasty, and for 3(8.1%) patients, the type of surgery was not documented; 20(40%) patients died(12 patients died before the surgery and 8 died after surgery at a median time of 3 days), 29(76.3%) patients had an unremarkable course throughout hospitalization and were discharged including 1(2.6%) patient managed non-operatively, and 1(2.6%) patient was admitted to the ICU after the surgery but eventually discharged. **Conclusion:** COVID-19 infected elderly patients have a higher 30-days mortality rate compared to non-COVID-19 infected cases. Further studies are warranted to look at the morbidity and mortality rates in COVID-19 positive patients with hip fractures and to investigate how these outcomes can be improved. **Level of evidence:** Level IV

Keywords

COVID 19, SARS-cov-2, coronavirus infections, surgery, hip, fracture, orthopedics

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Background

The outbreak of coronavirus disease 2019 (COVID-19) caused by the 2019 novel coronavirus (SARS-CoV-2) began in Wuhan, Hubei Province, China in December 2019, and has rapidly spread throughout the world forcing near total shut down of most countries.¹⁻³ The pandemic has overwhelmed healthcare systems, especially intensive care units (ICU), in the world. To minimize the risk of coronavirus spread, and to conserve manpower and resources, elective orthopaedic procedures were suspended in most countries. Most guidelines recommended hospital admission only for those patients who

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Table 1. Search Strategy of Embase and Medline Databases.

Embase May 9th 2020	Total articles
1) "COVID 19" OR "SARS-cov-2" OR "Coronavirus Infections"	10389
2) "Surgery" OR "Hip" OR "Fracture" OR "Orthopedics"	3813393
3) 1 and 2	258
Medline May 9th 2020	11806
1) "COVID 19" OR "SARS-cov-2" OR "Coronavirus Infections"	2849777
2) "Surgery" OR "Hip" OR "Fracture" OR "Orthopedics"	223
3) 1 and 2	
Total from Embase and Medline	481

needed it. They further recommended surgical treatment only where its results are superior to non-operative treatment.⁴⁻⁷ Existing literature suggests that COVID-19 affects most severely older patients and those with comorbidities.⁸ A group that has attracted little attention are those with hip fractures.⁹⁻¹² Generally, hip fractures are associated with increased morbidity and a 30-day mortality rate of 7–10%.¹³ To date, there is a dearth of studies looking into the morbidity and mortality rates among COVID-19 patients with hip fractures. We, therefore, aim from the current review to investigate the 30-day mortality caused by COVID-19 in this group of patients.

Methods

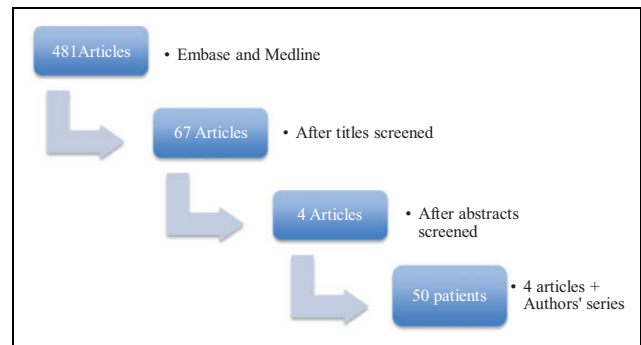
Search Strategy

The research question and inclusion criteria for individual studies were established prior to searching databases. Online databases (Embase and Medline) were used to find literature related to mortality and morbidity in COVID-19 patients who have undergone urgent hip surgeries. PubMed was also screened but it added less relevant articles compared to other databases as MeSH terms were not established by the time of search date. Key words included were "COVID-19" OR "SARS-cov-2" OR "Coronavirus Infections"; AND "Surgery" OR "Hip" OR "Fracture" OR "Orthopedics." The search was conducted on May 9th, 2020 and yielded a total of four-hundred and eighty-one articles from both databases, without any restriction on language or date of publication (Table 1).

The following inclusion criteria were used: (1) all levels of evidence irrespective of the study type, (2) male and female patients with no age limitation, and (3) all COVID-19 patients with hip fractures. We excluded patients with (1) pathological fractures, (2) non-hip fractures, and (3) non-traumatic hip pathologies.

Study Selection

Combined results of all searches produced four-hundred and eighty-one articles. Titles and abstracts were screened, yielding a total of 4 studies that satisfied our inclusion and exclusion criteria. All reviewers performed a full-text review of the 4 eligible studies and case-series (Figure 1).

**Figure 1.** Flow chart illustrating the article screening process.

Data Abstraction

One reviewer abstracted relevant study data from the final pool of the included studies and recorded them on a spreadsheet. These included study and publication information (author, year of publication, study design, level of evidence, and sample size), patients' data (age, sex, comorbidities, and pathology), surgical details (type of fixation), outcomes (acute respiratory distress syndrome "ARDS," respiratory failure, intensive care unit "ICU" admission, and death).

An unpublished case-series of 67 patients during COVID-19 outbreaks attended orthopaedic clinic at the University of Verona, Italy until May 14th, 2020 revealed 3 patients were COVID-19 infected with hip fracture who satisfy our inclusion criteria, and therefore, were added to the total number of patients included.

Results

A total of 50 patients were included in the final results. The age of the patients ranges from 50 to 100 years with a median age of 86 years. Female patients were 26 (52%). All the fractures were due to low energy injury except for 1 patient with traumatic brain injury who had a high-velocity (traffic) accident. Nearly 56% of patients had 1 or more comorbidities: hypertension (53.6%), diabetes mellitus type II (28.6%), and coronary artery heart disease (25%) were the most common comorbidities; the medical comorbidities were not reported in 22 patients. Thirty-four (68%) patients had intertrochanteric fracture and 16 (32%) patients had femoral neck fractures. Twenty-two (59.5%) patients underwent cephalomedullary nail fixation, 12

Table 2. Studies Included for Review.

Study	LOE	Sample Size	COVID Positive	Patients	Age	Sex	Comorbidities	Pathology	Type of Surgery	Outcome
1 Mi et al. 2020 ⁶	IV	10	3	1	50	F	HTN, DM	Intertrochanteric fracture	CMN	ICU admission (ARDS/ RF), discharged
				2	79	F	Osteoporosis	Femoral neck fracture	HA	Unremarkable
				3	76	M	Cirrhosis, Alzheimer disease	Intertrochanteric fracture	CMN	Death
				4	80	F	HTN, DM, CAHD	Intertrochanteric fracture	x	ICU admission (ARDS/ RF), Death
				5	84	F	HTN, Osteoporosis	Intertrochanteric fracture	x	Death
				6	85	M	Brain injury	Intertrochanteric fracture	x	Death
2 Lei et al. 2020 ⁷	III	34	2	1	83	M	HTN, CAHD, CVD	Femoral neck fracture	HA	ICU admission (ARDS/ RF), Death
				2	84	F	CAHD	Femoral neck fracture	HA	Unremarkable
3 Catellani et al. 2020 ⁸	IV	16	13	1	89	F	HTN, DM, MR	Intertrochanteric fracture	CMN	Unremarkable
				2	89	F	HTN, DM, HypoT4, DAS	Femoral neck fracture	HA	Unremarkable
				3	84	M	HTN, CAHD	Femoral neck fracture	HA	Unremarkable
				4	84	M	HTN, Hepatitis C	Intertrochanteric fracture	CMN	Unremarkable
				5	90	M	HTN, CAHD, CHF	Intertrochanteric fracture	CMN	Unremarkable
				6	90	F	HTN, remote CVA, VD, CHF	Intertrochanteric fracture	CMN	Unremarkable
				7	74	M	HTN, DAS, Obesity	Intertrochanteric fracture	CMN	Unremarkable
				8	82	M	CKD, BPH	Intertrochanteric fracture	CMN	Death
				9	86	M	HTN, HypoT4	Intertrochanteric fracture	HA	Death
				10	88	M	DM, CAHD, BPH	Femoral neck fracture	HA	Death
				11	85	M	CAHD, BPH	Intertrochanteric fracture	HA	Unremarkable
				12	82	M	HTN, remote CVA	Femoral neck fracture	CMN	Unremarkable
				13	85	F	DAS	Femoral neck fracture	CMN	Death
				14	79	F	HTN, HypoT4, Obesity	Intertrochanteric fracture	x	Death
				14	80	F	DM	Intertrochanteric fracture	x	Death
				16	82	M	DM, CKD	Intertrochanteric fracture	x	Death
4 Muñoz-Vives et al. 2020 ⁹	IV	136	23	1	89	M	NR	Intertrochanteric fracture	CMN	Death

(continued)

Table 2. (continued)

Study	LOE	Sample Size	COVID Positive	Patients	Age	Sex	Comorbidities	Pathology	Type of Surgery	Outcome
				2	93	M	NR	Intertrochanteric fracture	CMN	Death
				3	85	F	NR	Intertrochanteric fracture	x	Death
				4	100	M	NR	Intertrochanteric fracture	x	Death
				5	89	F	NR	Intertrochanteric fracture	x	Death
				6	95	F	NR	Intertrochanteric fracture	x	Death
				7	88	F	NR	Femoral neck fracture	x	Death
				8	85	F	NR	Intertrochanteric fracture	CMN	Unremarkable
				9	90	M	NR	Intertrochanteric fracture	NR	Unremarkable
				10	95	F	NR	Intertrochanteric fracture	CMN	Unremarkable
				11	89	F	NR	Femoral neck fracture	NR	Unremarkable
				12	87	M	NR	Intertrochanteric fracture	CMN	Unremarkable
				13	77	F	NR	Femoral neck fracture	HA	Unremarkable
				14	92	M	NR	Intertrochanteric fracture	CMN	Unremarkable
				15	86	M	NR	Femoral neck fracture	NR	Unremarkable
				16	91	M	OSAHS	Femoral neck fracture	HA	Unremarkable
				17	94	F	NR	Intertrochanteric fracture	CMN	Unremarkable
				18	85	F	NR	Intertrochanteric fracture	CMN	Unremarkable
				19	88	F	NR	Intertrochanteric fracture	CMN	Unremarkable
				20	97	M	NR	Intertrochanteric fracture	CMN	Unremarkable
				21	84	F	NR	Intertrochanteric fracture	CMN	Unremarkable
				22	72	M	NR	Femoral neck fracture	HA	Unremarkable
				23	89	F	NR	Intertrochanteric fracture	CMN	Unremarkable
Authors' case series	IV	67	3	1	100	F	Dementia	Intertrochanteric fracture	CM	Unremarkable
				2	91	M	HTN, DM, AF, CHF, AS, CKD, BPH	Femoral neck fracture	x	Death
				3	89	F	DAS	Femoral neck fracture	HA	Unremarkable

HTN: Hypertension; DM: Diabetes Mellitus type II; CAHD: Coronary Artery Heart Disease; MR: Mitral Regurgitation; HypoT4: Hypothyroidism; DAS: Depression and Anxiety Syndrome; CHF: Congestive Heart Failure; CVA: Cerebrovascular Accident; VD: Vascular Dementia; BPH: Benign Prostatic Hyperplasia; CKD: Chronic Kidney Disease; OSAHS: Obstructive Sleep Apnoea Hypopnoea Syndrome; AF: Atrial Fibrillation; AS: Aortic Stenosis; CMN: Cephalomedullary Nail; HA: Hemiarthroplasty; ARDS: Acute Respiratory Distress Syndrome; RF: Respiratory Failure; NR: Not Reported, X: No Surgery, CM: Conservative Management.

(32.4%) patients underwent hemiarthroplasty, and for 3 (8.1%) patients, the type of surgery was not documented. Twelve (24%) patients died before the surgery and 8 (16%) patients died after the surgery (total of 20 patients, 40%). The time from surgery to death ranged from 1 to 16 days, with a median of 3 days. Twenty-nine (76.3%) patients had an unremarkable course throughout hospitalization and were discharged including 1 (2.6%) patient managed non-operatively, and 1 (2.6%) patient was admitted to the ICU after the surgery but eventually discharged (Table 2).

Discussion

Many national guidelines have recommended that patients with hip fractures undergo surgery within 48 hours of admission long before the appearance of COVID-19.^{14,15} Various guidelines set during COVID-19 pandemic have, also, identified patients with hip fractures among those requiring urgent surgical intervention.⁴⁻⁷ Pre-COVID-19 studies have reported a 30-day mortality rate of 7-10% and postoperative pulmonary complications rate of 4.9%.^{12,16}

In the present review of 50 patients from 4 studies and case series, the overall death rate is 40% in COVID-19 positive patients. The death rate was mainly observed among elderly patients in their seventh and eighth decades of life. This finding is consistent with the trend of hip fracture in non COVID-19 elderly patients.¹⁷ One study reported only 14-days follow-up which may underestimate the 30-day mortality rate.¹³

It is clear from this small group that the mortality rate is much higher than in the non-COVID-19 patients with hip fractures. The virus's predilection to target the lungs combined with the severe discomfort resulting from hip fractures leading to poor respiratory effort seem to be a plausible explanation for these patients' poor condition on admission to hospital and high preoperative mortality rate. The comparatively lower postoperative mortality rate may reflect the positive pain relieving effect of surgical treatment of the fractures allowing for early rehabilitation and postural drainage of the lungs. What is not clear are the reasons why so many patients are admitted in such poor condition with such high preoperative mortality rate. It is noteworthy that Do Not Resuscitate (DNR) status was not documented, and therefore, these patients were to be denied ICU treatment, ventilator support, and cardiopulmonary resuscitation (CPR) when becoming seriously-ill. Not only being symptomatic with COVID-19, but also asymptomatic positive testing and, even simply, coming from a high COVID-19 environment (like a nursing home) seems to increase the mortality rate in patients with hip fractures.^{10,13} One possible explanation is that these patients may have had a false negative test.

This review has a number of limitations. The sample size is small. It included level 3 and 4 retrospective studies that are prone to selection, recall or misclassification bias, subject to confounding and cannot determine causation, only association. Moreover, the studies have some missing data and the reported number of COVID-19 positive patients with hip fractures since this pandemic has started is low to run any subgroup analysis.

The authors were contacted for the missing data but, unfortunately, because of the retrospective nature of these studies most of the requested data were not available. In addition, one of the included studies was published in a non-peer review journal, however, only 2 COVID-19 positive patients with hip fractures were included in that study.

In summary, the review revealed that the combination of COVID-19 positive and hip fracture carries a particularly high 30-days mortality rate compared to the non-COVID-19 patients with hip fracture. Clearly, greater protective measures from both COVID-19 exposure and hip fractures need to be instituted for this vulnerable group of patients. Given the evolving nature of the COVID-19 pandemic and its vast and rapid spread among population, especially nursing homes, it is important to report all data together so that a greater understanding of the disease in this group of patients is attained. Further studies are warranted to look at the morbidity and mortality rates in COVID-19 positive patients with hip fractures and to investigate how these outcomes can be improved.


Declaration of Conflicting Interests

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